Attica Automation

Operators Manual
AV-D100

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INTRODUCTION

Greeting

Welcome to the Attica Automation Family! We are pleased to be able to work with you to meet the quality standard you require. If there is anything we can say, it is our goal to make you successful as we continue our relationship together. If you ever have any questions or concerns, please feel free to contact us at any time.

Purpose

The purpose of this machine is to inspect and sort the quoted parts as outlined in the original proposal. Although the machine is capable of inspecting multiple products for many different defects, this manual will only cover the original parts specified for this machine.

If you have any questions on new parts, setups, or tolerances, please refer to the “System Operation” section of the manual. If you still need assistance, please contact us.

Audience

This manual is designed for operators and maintenance groups for the original client that purchased the machine. If the machine changes hands, there may be additional training and information required by the new owner of the machine. If that need arises, please contact Attica Automation Inc. (www.atticaautomation.com)

SYSTEM INFORMATION

Key Features

Some key features of the AV-D100 system are as follows:

- *IP Based Gigabit Ethernet Cameras*
- *Trigger Buffer Delay Software*
- *National Instruments Vision Builder Software*
- *Delta Human Interface Device (HMI)*
- *Delta PLC*

Inventory

For Specifics regarding the inventory of the machine, please contact Attica Automation (www.atticaautomation.com). We keep an active list of each machines parts as well as new technologies and parts that replace outdated parts.

Environment

The general guidelines for the environment that this machine needs to operate in are very basic. Outside of the air and electrical requirements, the following running condition should be met at all times:

- Temperature: 41ºF - 86ºF (5ºC - 30ºC)
- Air quality: Low dust environment
- Flooring: Structurally solid floor to handle vibration and weight

Replacement Parts

A replacement parts list is located in “My Documents” on the machine. If you cannot find the list, please contact Attica Automation to get a replacement.

Maintenance of the machine

Periodically, the system may need maintenance. The following areas are known areas that may need cleaning or maintenance:

- Dial – Clean the dial off with a window-cleaning product (windex, water, etc.) on a regular basis. A sign that the machine may need to be cleaned is a larger percentage of failed parts. NOTE: Over time, the dial may get damaged with use. For a new dial, please contact Attica Automation.
- Air regulator – The regulator can build up water in the lower portion of the regulator. To empty the water, turn the lower portion of the regulator to empty the water build up.
- Lenses – Over time, dust and dirt may start to cover the face of the lenses. Use water to clean the surface of the lenses if needed.
- Backlights - Over time, dust and dirt may start to cover the face of the lenses. Use water to clean the surface of the lenses if needed.

SYSTEM REQUIREMENT

First-Time Users

For all first time users, please review the entire operators manual before operating the machine (SPECIFICALLY the "System Operation" section). You will need to be familiar with all software and program setups as well as proper maintenance of the machine.

Although this machine is designed to create the least amount of potential user errors, please contact Attica Automation with any questions concerning the machine prior to making changes.

Power and Air Requirements

Installation of this machine requires power (110v 15a) and air requirements (80psi). Plug the electricity and air into the machine, and you are ready to move to the next step.

Setting up the Feeder Bowls

Configuring the system requires the feeder station's vibratory inline to be approximately 2 inches behind the trigger sensor as well as approximately 2mm off the top of the dial plate. This distance and placement is not rigid, but it gives the approximate location where the parts need to land on the dial.

SYSTEM OVERVIEW

System Architecture

The AV-D100 is rotary dial system that moves the product through each inspection station as well a reject station. The information below will outline each system. For any information not found in this manual, please contact Attica Automation. (www.atticaautomation.com)

IP network:

The IP network is used for the Camera Communication as well as Maintenance Communication. All network information is programmed into each device, so no changes should be necessary. All IP based devices are listed below:

- *Embedded Computer – 192.168.1.200*
- *Camera 1 – 192.168.1.211*
- *Camera 2 – 192.168.1.212*
- *Servo Motor – 192.168.1.40*
- *Delta HMI – 192.168.1.34*

Human Machine Interface (HMI) –

This device allows the operator to interface with the machine. This includes starting the machine, stopping the machine, viewing and clearing errors, setting batch count, and statistics of the machine.

Programmable Logic Controller (PLC)

The programmable logic controller (PLC) is a control system using electronic signals to control stored procedures, handy extending principles, functions of sequential/position control, timed counting, and input/output control.

PLC and HMI Communication

The PLC and HMI communicate via a serial cable (RS485). The HMI is then connected to the computer through an Ethernet via a network switch. All communication is initiated via the software located on the embedded computer. This is all for programming purposes ONLY. Please do not change these settings without consulting Attica Automation. If changes are made to the PLC and HMI without our knowledge, your warranty will become invalid.

Feeder Bowl –

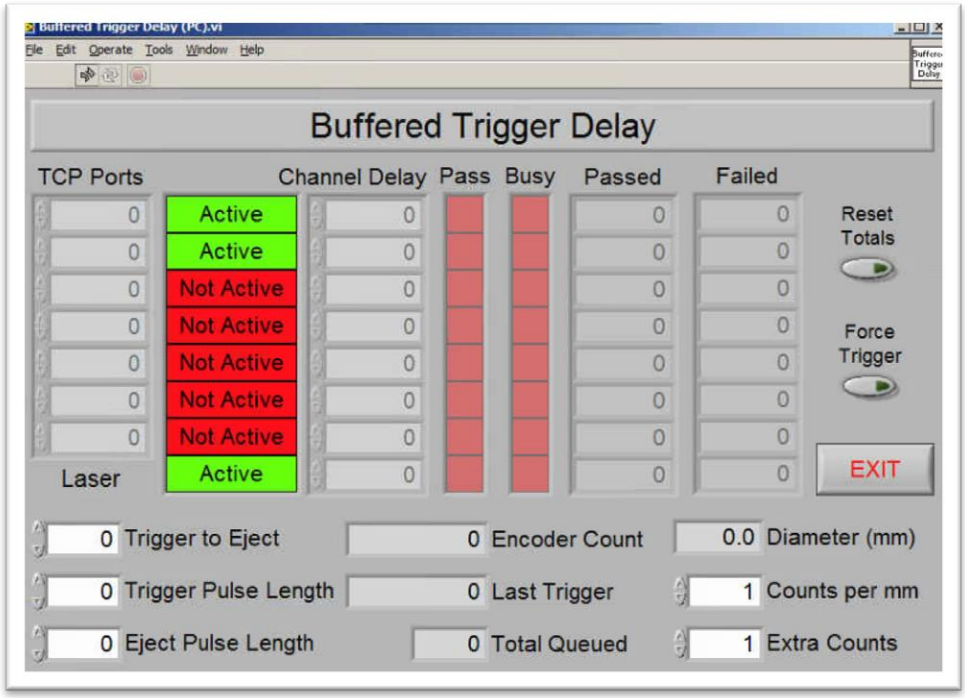
There is no feeding system included on this sytem.

Inspection Software Overview

This section outlines the different aspects of the inspection system. Below is a description of each subsystem as well as the instructions on how to manage the systems:

Trigger Buffer Delay –

This software is used to track the part, adjust the blow off time, adjust blow off length, turn cameras on and off, as well as change camera trigger time. This software must be open ***before*** the inspection software to allow I/O paths to be mapped.



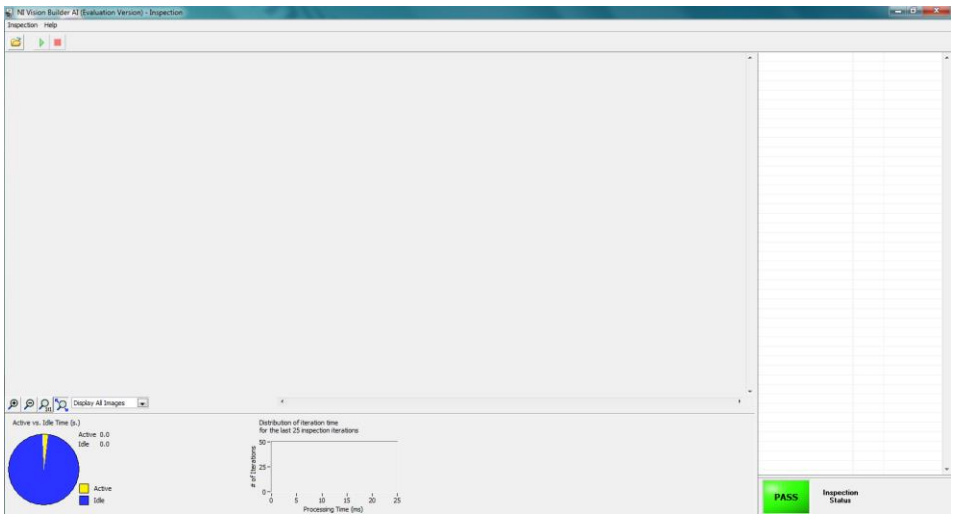
- ***TCP port*** – *Camera are mapped with TCP ports.*
    - *Camera 1 (502), Camera 2 (503), and so on.*
- ***Channel Delay*** – *The amount of encoder counts it takes to trigger that camera to take a picture.*
- ***Trigger to eject*** – *Amount of encoder counts it takes to enable the blow off to eject the part from the system.*
- ***Trigger Pulse Length*** – *the length of the actual signal that goes to the PLC.*
  THIS DOES NOT NEED TO BE CHANGED
- ***Eject Pulse Length*** – *The amount of encoder counts the system keeps the reject mechanism (air) turned on.*
- ***Force Trigger*** – Forces all cameras to trigger. Used for setup of new parts.

National Instruments Vision Builder -

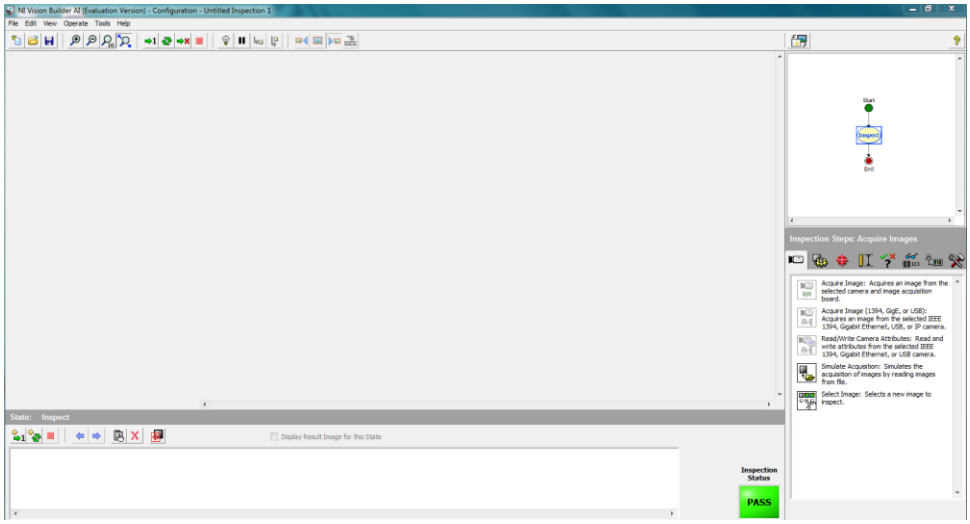
This software takes pictures of the parts and compares them to the settings and steps added to the inspection. After this finishes, the software qualifies them as Pass or Fail.

NOTE: An instance of this software must be open for each camera is use unless a custom user interface has been created.

- Operators User Interface – This interface consists of the option to start, stop, and change programs only. To get more information on running the system, please refer to our “Operating the Machine” Section.



- Configuration User Interface – This interface consists of the option to program new parts, add inspection steps, change camera settings, change tolerances, and edit the inspection process completely. To get more information on running the system, please refer to our “Operating the Machine” Section.

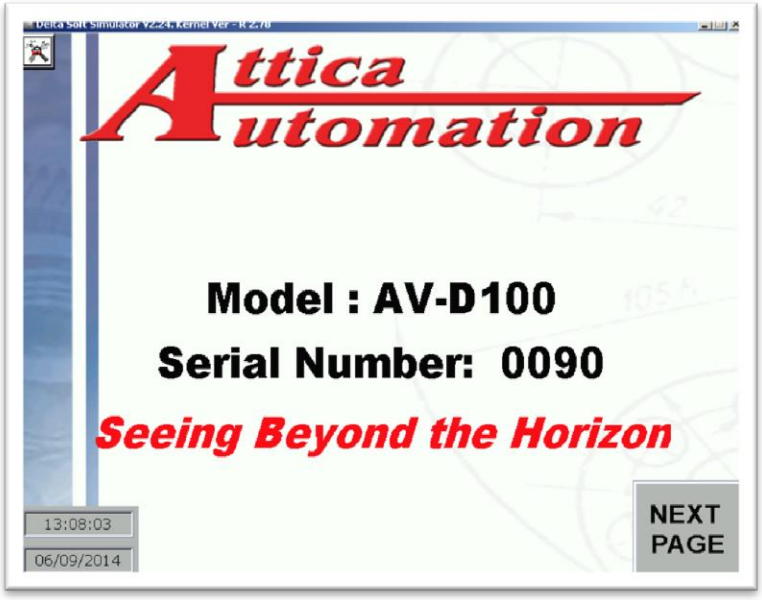


Human Machine Interface (HMI) Overview

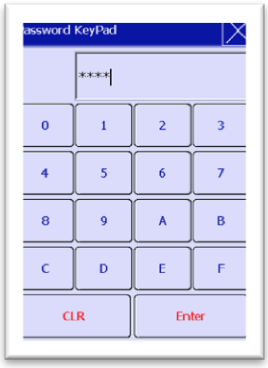
HMI Interface Overview

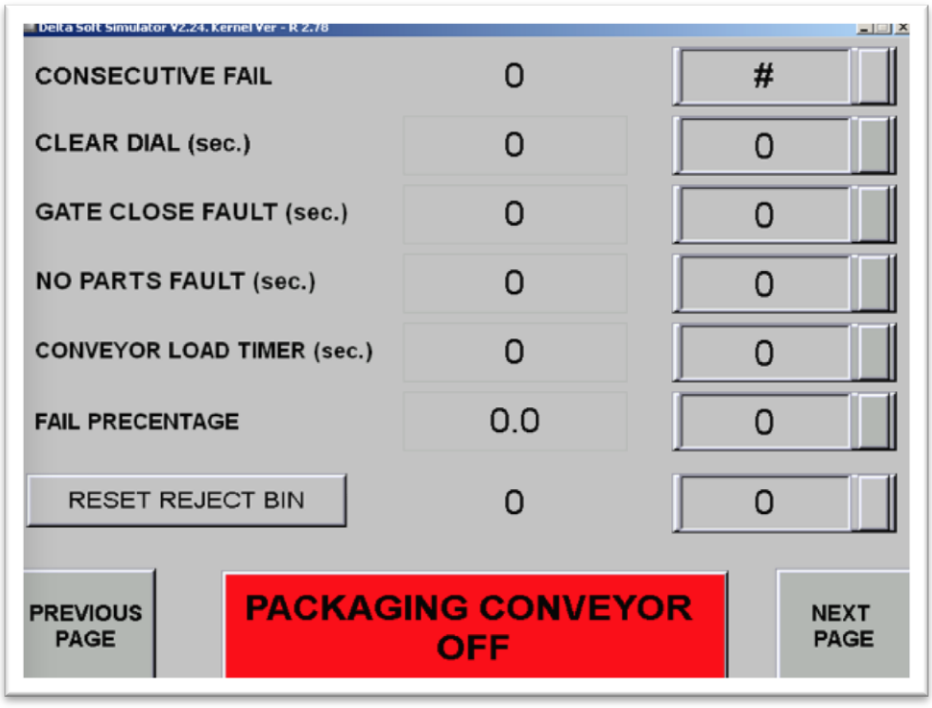
This section will review the different options and screens available on the AV-D100.

- Main Screen – This screen displays the machine information including the model number, serial number, and Date and Time. It also gives you access to see the Configuration Page, Operators page, and Setup Page.

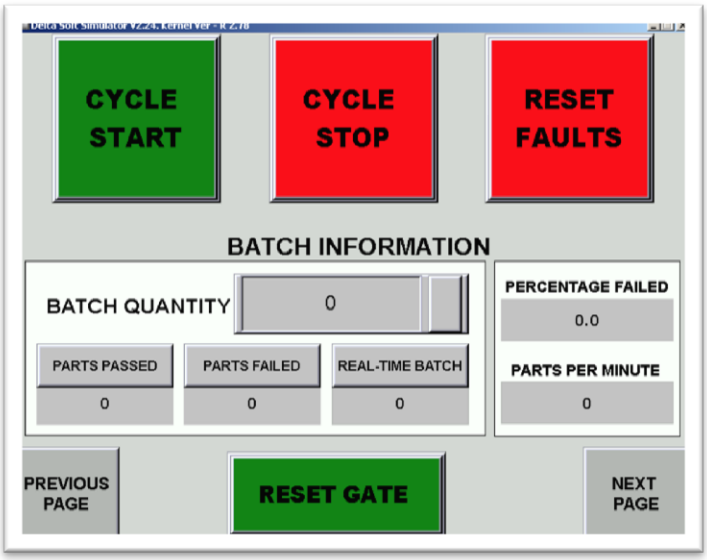


- Configuration Page – This page is used to change the configuration settings for the faults on the machine. Each button can be touched to change the value. This page is password protected as well. If you need this password, please contact Attica Automation.



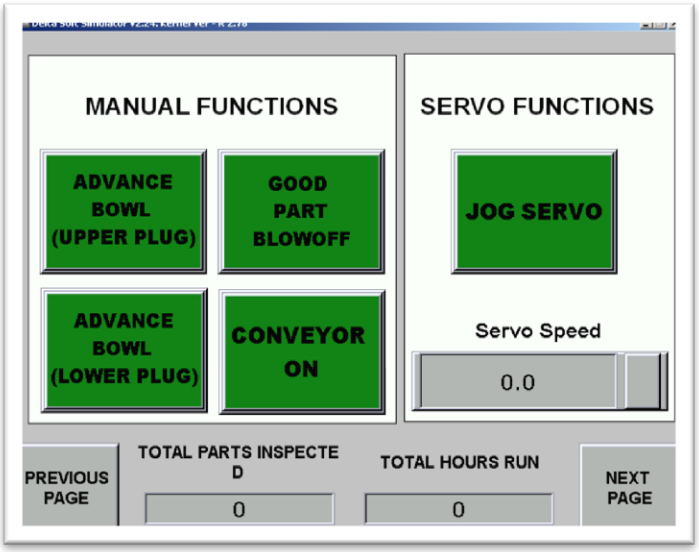

Delta Soft Simulator V2.24. Kernel Ver - R 2.78
CONSECUTIVE FAIL 0 #
CLEAR DIAL (sec.) 0 0
GATE CLOSE FAULT (sec.) 0 0
NO PARTS FAULT (sec.) 0 0
CONVEYOR LOAD TIMER (sec.) 0 0
FAIL PRECENTAGE 0.0 0
RESET REJECT BIN 0 0
PREVIOUS PAGE
PACKAGING CONVEYOR OFF
NEXT PAGE

- Operator's Page – This page is used to operate the machine, setup batch information, and display performance information.



  - To operate the machine, touch the buttons that perform the requested operation.
  - To reset any of the values for batch information, touch the button in question and hold for 5 seconds.
  - Performance information is for reference only. These values cannot be changed.

- Setup Page – This page contains controls that are useful when setting up the machine as well as information about the machine's total run time.



  - Advance Bowl (Upper Plug) – Pushing this button will turn on the upper power plug without turning the machine on.
  - Advance Bowl (Lower Plug) – Pushing this button will turn on the lower power plug without turning the machine on.
  - Good Part Blow Off – Test to verify the good part blow off is working properly.
  - Conveyor On – If there are no boxes in the conveyor, this will advance the conveyor to load a new box.
  - Job Servo – This is manually advance the servo drive.
  - Servo Speed – Adjusting this number will change the speed of the dial.

HMI Fault and Error Messages

- E-Stop - The Emergency Stop button has been pressed.
- Low Air Pressure – There is not enough pressure for the system to run properly.
- Servo Fault – There is an error on the servo. This can be caused by a system overload.
- Servo Drive Not Home – The servo drive has not been homed yet. This machine homes itself on boot-up.
- No Parts Fed – There are no parts being fed to the system.
- Consecutive Reject Fault – Consecutive reject limit has been reached without any passed parts.
- Reject Bin Full – The reject bin has met the stated limit and needs to be emptied
- Reject Percentage Too High - This is based on the total percentage of the parts run on the machine. If the total parts failed reset, the percentage will start from Zero again.
- Gate Closed Timeout - This is based on the amount of time that the conveyor gate is closed. It will error out when the timer is reached. This controls the amount of parts that can build up in the chute.
- Conveyor Timeout – Good parts chute end cap has been closed too long. Possible error occurs when there are no boxes in the conveyor for an extended amount of time.
- Conveyor Lift Timeout – The conveyor did not see the box of parts exit the conveyor. There is a sensor that requires the box to pass before the lift cylinder will lower.

SYSTEM OPERATION

Starting the System

To start the system, do the following:

- Turn the *main-switch* to the right. This switch is a direct power on/off to the entire machine.
- Press the *Green button* next to the main power switch. This button gives power to the inspection side of the machine (cameras, laser, etc.). Once this button is pressed, the machine's inspection system has been powered on.
- The computer will power itself on once the main switch has been powered on. There is no need to physically power the computer on.

Shutting down the System

To power the system down, follow the steps below:

- Turn the computer off by going to Start→shutdown on the windows based embedded computer. This will power the computer down properly and prevent any issues with the data corruption on the computer.

  DO NOT USE THE MAIN POWER SWITCH TO POWER THE MACHINE DOWN UNTIL THE COMPUTER HAS BEEN SHUT DOWN PROPERLY.

- Once the computer has powered down, you should move the main power switch to the off position (left). This will remove all power to the machine.

Emergency Shut down of the System

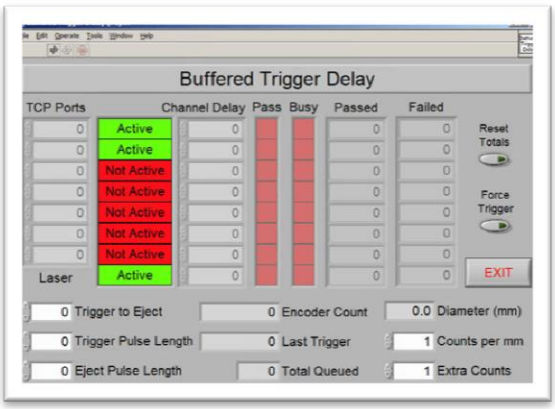
In an emergency situation, press the "Emergency Stop" button. This will stop the dial and shut down the inspection system.

To resume operation, pull the "Emergency Stop" button back out and press the Green button to restart the Inspection Components.

Setup of the system

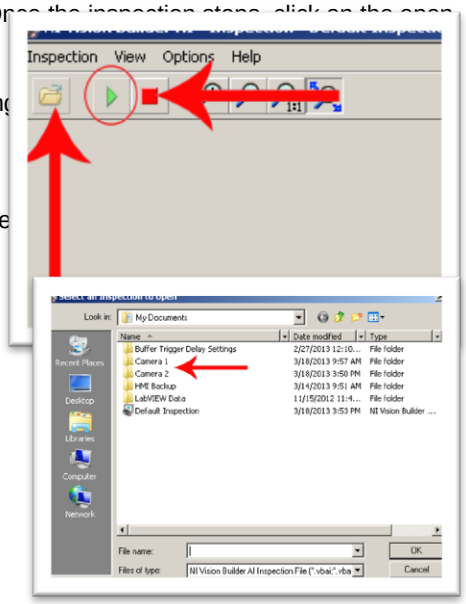
Software

The following section outlines the process needed to setup the software to run inspection on a part. The steps outlined below need to be performed in order as specified below:



1. Verify the Buffer Trigger Delay software is open: Each part will have specific settings to control the blow off time and blow off length. The settings can be found under a folder called "Buffer Trigger Delay Settings" in my documents. Find the part number and open the file. You will see a screen shot of the software. Match your software with the screen shot.

2. Open the National instruments (NI) software if it is not opened already. Go to start→Vision Builder AI 2012 to do this. This shortcut may also be located on your desktop. Once this is completed, go to the next step.



3. In the NI software, click on the stop button if it is selected. Once the inspection stops, click on the open button to open up the desired part number you want to run.

4. Perform this step for each camera in operation. This will bring up each specific part number for each inspection station.

5. The window that opens will direct you to the My Documents Folder by default. From here you will now double-click on the desired camera folder. You will then see a list of part number. Double-click on the part number that you want to run on the machine.

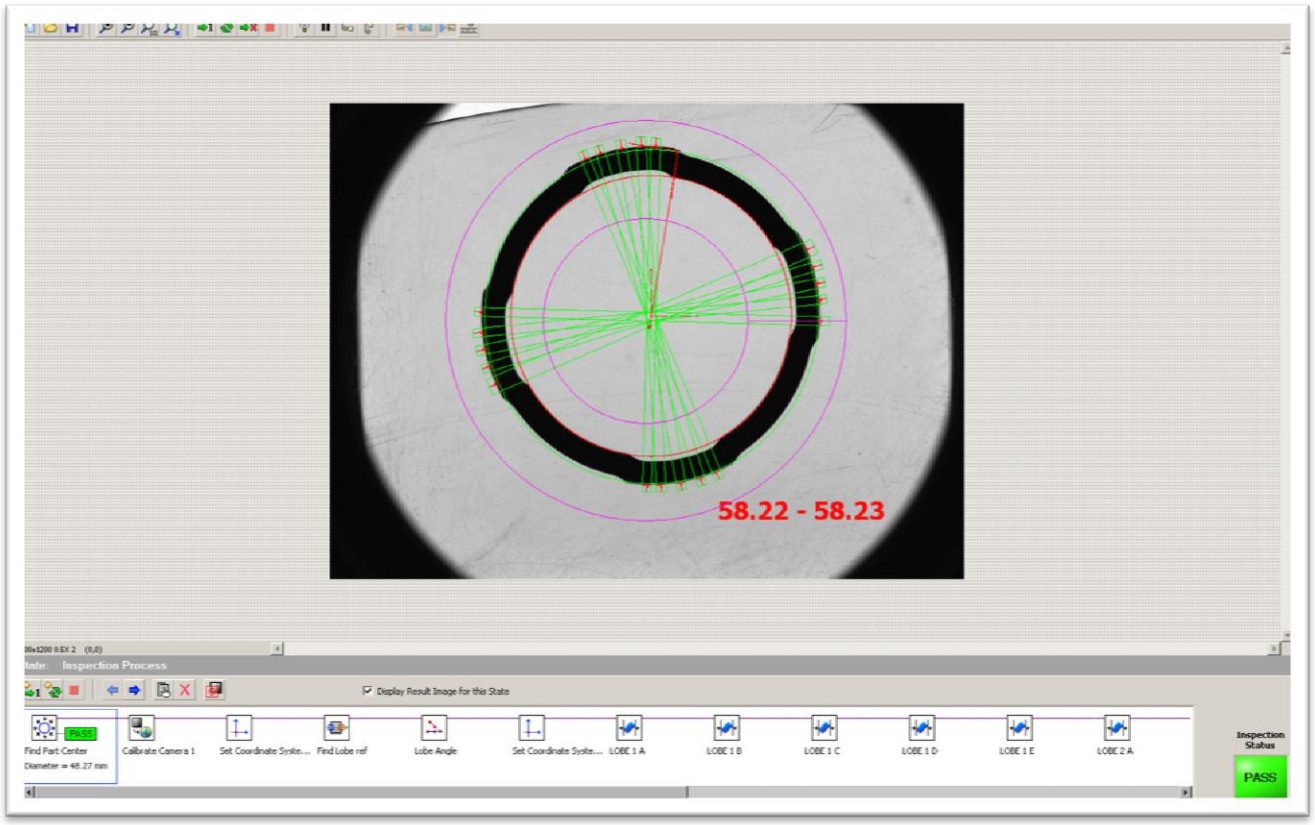
6. After the software opens the inspection, you will then click on the play button to start the inspection process for the camera.

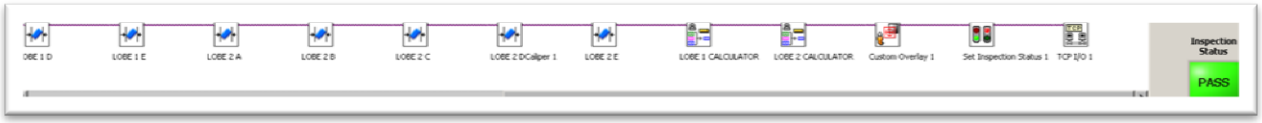
7. **IMPORTANT**: Please complete steps 2 through 5 for each camera that you need to run the inspection on.

Software – Defect Overview

The following section outlines the initial setup and processes for finding the defects quoted on this system. The documentation below covers the cameras systems as a whole. Each part will be edited as the machine runs in production.

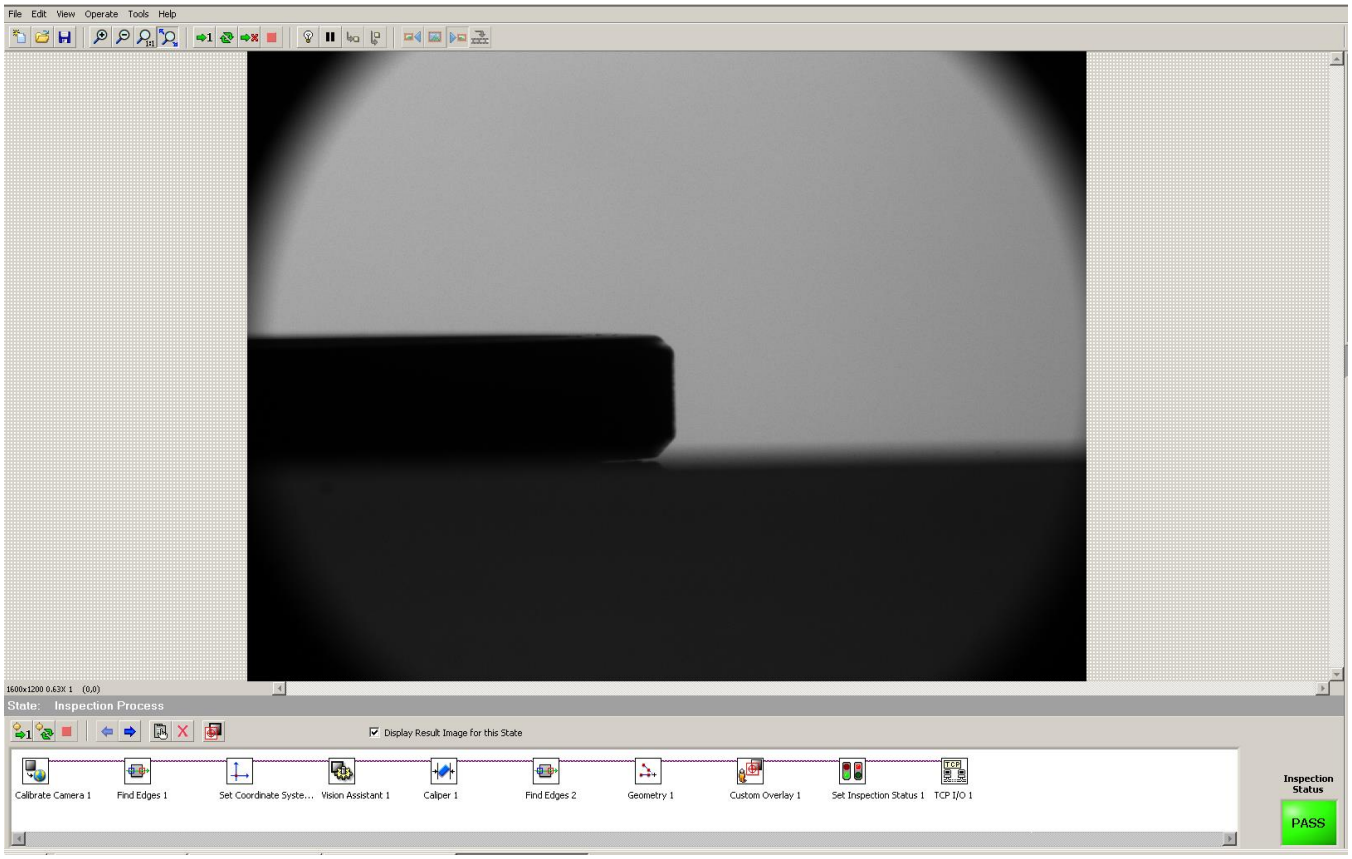
Camera 1 -





1.) Find Part Center - This tool is designed to locate the part only.
2.) Calibrate Camera 1 – This tool is designed to calibrate the part.
3.) Set Coordinate System 1 – This tool is used as a reference point for the rest of the inspection process.
4.) Find Lobe ref – This tool is used to find a reference point of one lobe.
5.) Lobe Angle – This tool finds the angle of the lobe in comparison to the center of the part.
6.) Set Coordinate System 2 – This tool is used as a reference point for the rest of the inspection process.
7.) Lobe 1 A – This tool is used as a caliper to find one of the sides of lobe 1.
8.) Lobe 1 B – This tool is used as a caliper to find one of the sides of lobe 1.
9.) Lobe 1 C – This tool is used as a caliper to find one of the sides of lobe 1.
10.) Lobe 1 D – This tool is used as a caliper to find one of the sides of lobe 1.
11.) Lobe 1 E – This tool is used as a caliper to find one of the sides of lobe 1.
12.) Lobe 2 A – This tool is used as a caliper to find one of the sides of lobe 2.
13.) Lobe 2 B – This tool is used as a caliper to find one of the sides of lobe 2.
14.) Lobe 2 C – This tool is used as a caliper to find one of the sides of lobe 2.
15.) Lobe 2 D – This tool is used as a caliper to find one of the sides of lobe 2.
16.) Lobe 2 E – This tool is used as a caliper to find one of the sides of lobe 2.
17.) Lobe 1 Calculator – This tool calculates the average diameter of the lobe based off the numbers from the previous steps.
18.) Lobe 2 Calculator – This tool calculates the average diameter of the lobe based off the numbers from the previous steps.
19.) Custom Overlay – This tool overlays the results on the screen.
20.) Set Inspection Status – Sets the entire inspection to PASS or FAIL based on the preceding step.
21.) TCP I/O – Sends an output to the computer to pass or fail the part.

Camera 2 –



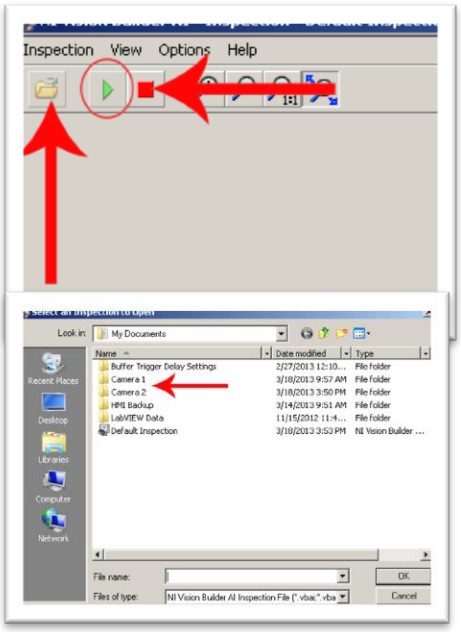
1.) Calibrate Camera 1 – This tool calibrates the image.
2.) Find Edges 1 – This tool finds the vertical edge of the part.
3.) Set Coordinate System 1 – This tool uses the edges and sets a reference point for upcoming steps.
4.) Vision Assistant 1 – This tool enhances the dial surface to find the edges for the height measurement.
5.) Caliper 1 – This tool finds the max height of part.
6.) Find Edges 2 – This tool finds the edges of the dial for height measurements.
7.) Geometry 1 – Geometry tool used to calculate the height of the part.
8.) Custom Overlay 1 – This tool overlays the geometry measurement on top of the image for the user to see.
9.) Set Inspection Status – Sets the entire inspection to PASS or FAIL based on the preceding step.
10.) TCP I/O – Sends an output to the computer to pass or fail the part.

Adjusting the system

Changing to a new part

In the NI software, you need to first click on the stop. Once the inspection stops, click on the open button to open up the desired part number you want to run.

The window that opens will direct you to the My Documents Folder by default. From here you will now double-click on the desired camera folder. You will then see a list of part number. Double-click on the part number that you want to run on the machine.

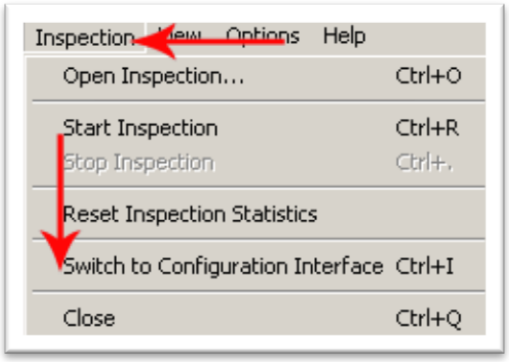


NOTE: Perform this step for each camera in operation.

Changing Inspection Steps and Tolerances

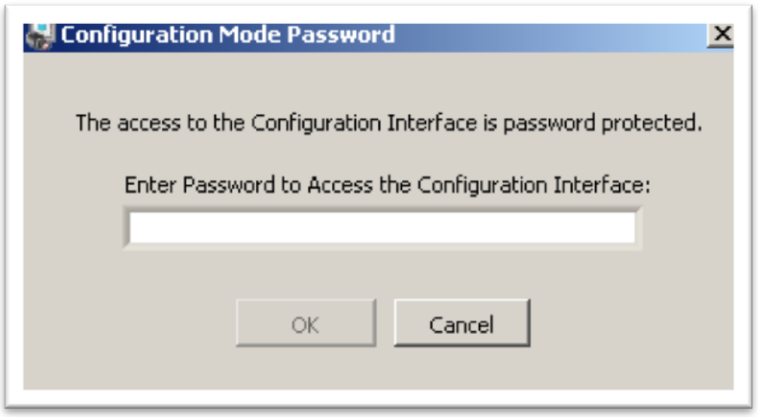
****ATTENTION****

Changing a program may cause the program to longer work. Only trained individuals should access this area

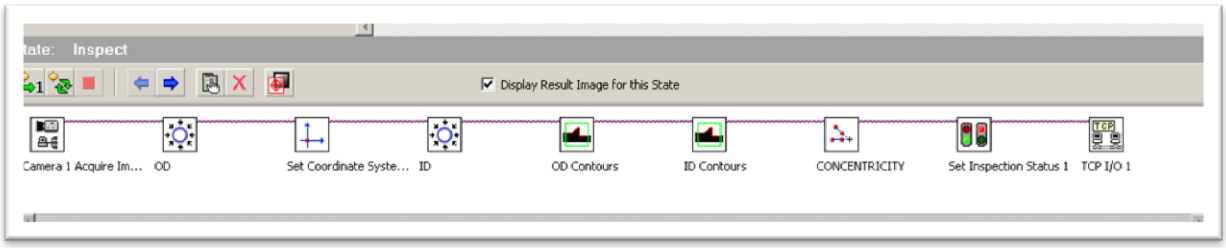


- First, you need to get into the inspection interface. Go to the top left and click on Inspection→Switch to Configuration Interface. This will take a few seconds, but it will take you into the configuration interface to change/add/remove tolerances, things to find, etc.

- You will then see a prompt for a password to get into the configuration interface. Input the password and hit OK. To get this password, please contact you Manager.


Configuration Mode Password
The access to the Configuration Interface is password protected.
Enter Password to Access the Configuration Interface:
OK
Cancel

- Once you get in the interface, you will see a screen like the one below:



You will notice that the inspection process completes each step in a linear fashion from acquiring an image to sending an output of Pass or Fail.

NOTE: there must be a picture on the screen to **add** steps to the inspection process since the steps are based on the image in memory.

Once you find the parameter you want to change (Example: OD, ID, Concentricity, etc.), double click on the step. This will take you into the setup of that tool. From here you will find many settings that you can change or modify to get the software to fit the criteria you are looking for.

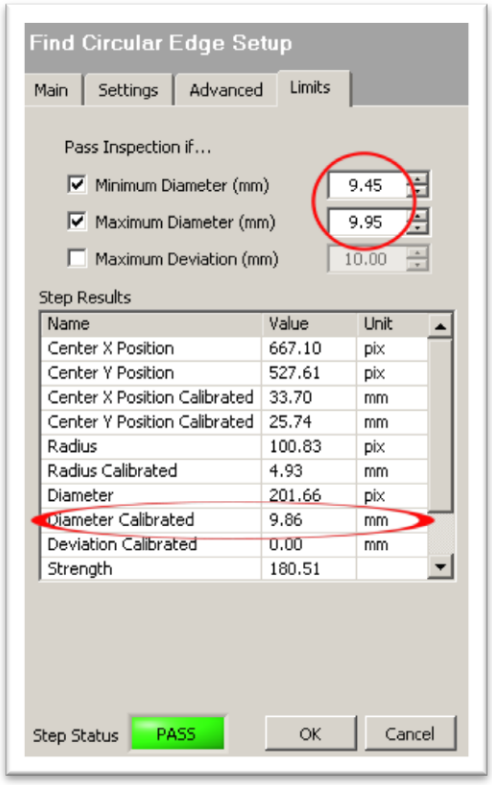
WARNING: Do not change these settings if you are not sure what they do.

- Changing the Tolerance:

This is one area of the settings that we want you to be comfortable with. Once you are in the settings of the step, go to the rightmost tab called “Limits”. Here you will find a screen like the screenshot to the right. The screenshot shows the “Pass Inspection if…” settings. These are the limits/tolerances that it considers when choosing to send a pass or fail signal.

Below that you will find your “step results”. These are the measurements that are stored in memory for the current image that is on the dial. You will notice that the software measures in Pixels and is then calibrated to the measurement system of your choice (Metric, English, Pixels, Microns, Etc.)

The “Diameter Calibrated” is the actual measurement of the part. This is what the Limits will measure off of. From that point, you can set your minimum and maximum limits in the “Pass Inspection if…” area.



- Once your settings are as desired, click OK on all the steps until you are back to the configuration screen.

- ***NOTE:*** HIT SAVE to save your settings. If this is not completed, the settings and changes you made will not go into effect.

- Go back up to Inspection→“Switch into Inspection Interface”, and this will take you back to run you part again.

Setting up a new part

Each part has to be programmed and setup prior to inspecting the defects. Most f the time, a part can be copied and renamed to create new parts. From here you will need to change/add/delete the inspection steps necessary to meet the requirements for your new parts.

REMEMBER: if you do not remember to rename and save the part, you will overwrite the original part.

TROUBLESHOOTING

Electrical Schematics

All files related to the electrical schematics are located on the machine under “My Documents”.
If these files are removed or cannot be found, please contact Attica Automation for a new copy.

FAQs

Question – There seems to be a lot of failed parts?

Answer – Check each camera and see what step the failures are happening at. If it is a camera setup that is causing the failure, it could be that your tolerances are too tight for the specific task. It also could be that the feeding system (dial or belt) is dirty and needs to be cleaned. Either way, you can look at the camera to see what step is causing the failures.

Question – I have all the cameras open, but no parts are passing?

Answer – It sounds like you have the cameras open, but you have not started the inspection process on either 1.) Each camera 2.) the trigger buffer delay software. Verify that each camera is in inspection mode (Green triangle = inspect, Red square = stop). Also verify that the Trigger Buffer Delay software is open as well as each camera turned on.

NOTE: The Trigger Buffer Delay software needs to be opened before the NI vision builder software is opened.

SYSTEM MANAGEMENT

Change Management

Attica Automation keeps an original image of the computer and gives the client the ability to change the machine to whatever specifications they require. The built in access controls are managed based on the clients access controls. Passwords and permissions are not controlled through Attica, and in the event that the client changes something that causes the machine to go down, Attica's warranty will not cover the damage. Attica Automation will, however, help service the machine at Attica's going service rates based on scheduling times and availability.

Access Controls

The AV-D100 is designed to be user friendly as possible while still giving you the tools to customize the machine to your specific needs. There are two areas of this machine that are password protected to hinder general operators from causing problems with the machine. These areas are listed below with their specific usage description:

HMI Fault Setup:

On the HMI, there is small Wrench icon in the upper left hand corner of the HMI startup screen. This screen allows you to change the HMI error limitation settings. Examples of these settings are Consecutive fail rate, gate closed fault, and no parts fault.

Embedded computer administrator:

There is an account on the Embedded Computer named "Administrator". This account has full access rights on the machine. The purpose of this account is for maintenance and management only. This is also the account Attica Automation uses for remotely accessing the computer. This account is not to be used by the operators at any time unless permission is given to them by Attica Automation, or their upper management.

Configuration Interface Password:

There is a password to get into the configuration mode of the inspection interface. This is require to inhibit the operator from changes inspection settings without the knowledge of management.

To request access to either of these accounts, please contact your manager or Attica Automation.

Configuration Management

Attica Automation performs initial setup and configuration of the machine unless agreed to by the Attica Automation and the client. Anything outside of this setup time is the responsibility of the client based on the authority and access rights given to their employees.

Security Administration

For all security questions and password changes, please contact your manager. Attica Automation will also keep a record of the original passwords and the original image of the machine if any problems arise.

SERVICE MANAGEMENT

Attica Automation will do everything in its power to help you with your new machine. Please contact us with any question or concern that you may have, and we will work with you to keep your down time minimized as well as help keep you product 100% inspected.

Key Contacts

Support:

Phone: (810) 793-5400

Email: support@atticaautomation.com

Sales:

Phone: (810) 793-5400

Email: sales@atticaautomation.com

Remote System Support

We have the ability to remote control the computer to help resolve issues that may arise. If an Internet connection is available, please give our support team a call to remotely connect to the machine to help you resolve the issue.

NOTE: If the problem is not covered under warranty, a service charge may be incurred.

Attica Automation

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